

Appl. No. 10/034,734
Amdt. dated 3/28/05
Reply to Office Action of 9/28/04

PATENT
Docket: 010161

IN THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) An automatic gain control (AGC) apparatus operable during direct conversion of RF signals comprising:

an analog variable gain amplifier;

a digital variable gain amplifier coupled to an output of the analog variable gain amplifier, and

a gain controller adapted to measure a signal output from the digital variable gain amplifier and to control the gains of the analog and digital variable gain amplifiers.

2. (Original) The apparatus of claim 1, further comprising:

a DC offset canceller interposed between the output of the analog variable gain amplifier and an input of the digital variable gain amplifier, wherein an AGC loop gain is varied according to an operating mode of the DC offset canceller.

3. (Currently Amended) A method of operating an automatic gain control (AGC) loop in combination with a DC loop during direct conversion of RF signals, comprising:

selecting a particular DC operating mode for the DC loop from among a plurality of possible DC operating modes;

operating the DC loop in the selected DC operating mode to correct for DC offset in a desired signal;

selecting a particular AGC operating mode for the AGC loop from among a plurality of possible AGC operating modes based on the selected DC operating mode; and

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operating the AGC loop in the selected AGC operating mode to provide variable gain for the desired signal.

4. (Original) The method of claim 3, wherein the plurality of possible DC operating modes include an acquisition mode and a tracking mode.

5. (Original) The method of claim 4, wherein the acquisition mode has a wider loop bandwidth than that of the tracking mode and is used to more quickly remove a large DC offset in the desired signal.

6. (Original) The method of claim 3, wherein each of the plurality of possible AGC operating modes is associated with a respective AGC loop gain.

7. (Original) The method of claim 3, wherein the plurality of possible AGC operating modes includes a normal mode and a low gain mode.

8. (Original) The method of claim 7, wherein the plurality of possible AGC operating modes further include a freeze mode.

9. (Original) The method of claim 4, wherein the selected AGC operating mode is a low gain mode when the selected DC operating mode is the acquisition mode.

10. (Original) The method of claim 4, wherein the selected AGC operating mode is a freeze mode when the selected DC operating mode is the acquisition mode.

11. (Currently Amended) A direct conversion receiver unit in a wireless communication system, comprising:

a DC loop configurable to operate in one of a plurality of possible DC operating modes to correct for DC offset in a desired signal; and

an automatic gain control (AGC) loop configurable to operate in one of a plurality of possible AGC operating modes to provide variable gain for the desired signal, wherein the particular AGC operating mode to be used is determined based on the particular DC operating mode selected for use for the DC loop.

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12. (Currently Amended) ~~An control apparatus in a wireless communication system~~
adapted for use in a direct conversion receiver, comprising:

means for selecting a particular DC operating mode for a DC loop from among a plurality of possible DC operating modes;

means for operating the DC loop in the selected DC operating mode to correct for DC offset in a desired signal;

means for selecting a particular AGC operating mode for an automatic gain control (AGC) loop from among a plurality of possible AGC operating modes based on the selected DC operating mode; and

means for operating the AGC loop in the selected AGC operating mode to provide variable gain for the desired signal.

13. (Currently Amended) A method of operating a DC loop in a direct conversion receiver unit, comprising:

selecting a particular operating mode for the DC loop from among a plurality of possible operating modes that include an acquisition mode; and

if the selected operating mode is the acquisition mode,

operating the DC loop in the acquisition mode for a particular time duration to correct for DC offset in a desired signal, wherein the particular time duration is inversely proportional to a loop bandwidth for the DC loop for the acquisition mode, and

transitioning out of the acquisition mode after the particular time duration.

14. (Original) The method of claim 13, wherein the acquisition mode is selected in response to an event expected to result in a large DC offset in the desired signal.

15. (Currently Amended) A method of operating a DC loop in a receiver unit, comprising:

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selecting a particular operating mode for the DC loop from among a plurality of possible operating modes that include an acquisition mode; and

if the selected operating mode is the acquisition mode,

operating the DC loop in the acquisition mode for a particular time duration to correct for DC offset in a desired signal, wherein the particular time duration is inversely proportional to a loop bandwidth for the DC loop for the acquisition mode, and

transitioning out of the acquisition mode after the particular time duration,

the acquisition mode being selected in response to an event expected to result in a large DC offset in the desired signal,

~~The method of claim 14, wherein the event corresponds to a switch to new analog circuit stages to process the desired signal.~~

16. (Currently Amended) A method of operating a DC loop in a receiver unit, comprising:

selecting a particular operating mode for the DC loop from among a plurality of possible operating modes that include an acquisition mode; and

if the selected operating mode is the acquisition mode,

operating the DC loop in the acquisition mode for a particular time duration to correct for DC offset in a desired signal, wherein the particular time duration is inversely proportional to a loop bandwidth for the DC loop for the acquisition mode, and

transitioning out of the acquisition mode after the particular time duration,

the acquisition mode being selected in response to an event expected to result in a large DC offset in the desired signal, ~~The method of claim 14, wherein the event corresponds to application of a new DC offset value to correct for static DC offset in the desired signal.~~

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17. (Original) The method of claim 13, wherein the plurality of possible operating modes further include a tracking mode.

18. (Currently Amended) A method of operating a DC loop in a receiver unit, comprising:

selecting a particular operating mode for the DC loop from among a plurality of possible operating modes that including at least e an acquisition mode and a tracking mode; and

if the selected operating mode is the acquisition mode,

operating the DC loop in the acquisition mode for a particular time duration to correct for DC offset in a desired signal, wherein the particular time duration is inversely proportional to a loop bandwidth for the DC loop for the acquisition mode, and

transitioning out of the acquisition mode after the particular time duration.

~~The method of claim 17, wherein the transition is being made from the acquisition mode to the tracking mode after the particular time duration.~~

19. (Original) The method of claim 13, wherein the particular time duration is further selected based on an expected amplitude of the DC offset in the desired signal.

20. (Original) The method of claim 13, wherein the particular time duration is further selected to minimize a combination of DC offset introduced in the desired signal and loop noise from the DC loop.

21. (Currently Amended) A DC loop ~~in a~~ for use in a direct conversion receiver unit, comprising:

a summer operative to subtract a DC offset value from a desired signal to provide a DC offset corrected signal; and

a loop control unit configurable to operate in one of a plurality of possible operating modes to provide the DC offset value, wherein the plurality of possible operating modes include

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an acquisition mode having a particular loop bandwidth, and wherein the loop control unit is operated in the acquisition mode, when selected, for a particular time duration inversely proportional to the loop bandwidth for the acquisition mode and to transition out of the acquisition mode after the particular time duration.

22. (Currently Amended) ~~An apparatus in a~~ direct conversion receiver unit, comprising:

means for selecting a particular operating mode for a DC loop from among a plurality of possible operating modes that include an acquisition mode; and

means for operating the DC loop in the acquisition mode for a particular time duration, if the selected operating mode is the acquisition mode, to correct for DC offset in a desired signal, wherein the particular time duration is inversely proportional to a loop bandwidth for the DC loop for the acquisition mode, and

means for transitioning out of the acquisition mode after the particular time duration.

23. (Currently Amended) In a direct conversion receiver, a method of digitally amplifying a desired signal, comprising:

receiving a gain represented in a logarithm format;

determining a difference between the received gain and a gain offset;

converting the difference, represented in the logarithm format, to an output gain represented in a linear format; and

digitally multiplying the desired signal with the output gain.

24. (Currently Amended) A digital variable gain amplifier (DVGA) for use in a direct conversion receiver comprising:

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a first unit operative to receive a gain represented in a logarithm format and to determine a difference between the received gain and a gain offset;

a second unit operative to convert the difference, represented in the logarithm format, to an output gain represented in a linear format; and

a digital multiplier operative to multiply input samples with the output gain to provide output data.

25. (Original) The DVGA of claim 24, further comprising:

a multiplexer operative to multiplex inphase and quadrature input samples into a single sequence of samples, and wherein the digital multiplier is operative to multiply the inphase and quadrature input samples in a time-division multiplexed manner.

26. (Currently Amended) An apparatus for use in a direct conversion receiver for digitally amplifying a desired signal, comprising:

means for receiving a gain represented in a logarithm format;

means for determining a difference between the received gain and a gain offset;

means for converting the difference, represented in the logarithm format, to an output gain represented in a linear format; and

means for digitally multiplying the desired signal with the output gain.

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